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McGraw-Hill Publications Company
1221 Avenue of the Americas
New York, New York 10020

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C5800-19

6/10/81

May, 1981

26TH ANNUAL McGRAW-HILL SURVEY OF BUSINESS' PLANS FOR RESEARCH AND DEVELOPMENT EXPENDITURES, 1981-84

U.S. companies plan to boost their research and development (R&D) spending by a substantial 17% in 1981 to $50.5 billion, according to the 26th annual McGraw-Hill survey of R&D spending. If plans are realized, growth in R&D spending would outpace advances in both capital spending and sales, suggesting that U.S. firms intend to commit relatively larger shares of their resources to researching and developing new and improved products and processes.

Highlights of the Survey

- After adjusting for inflation, industrial R&D spending in 1981 could grow about 7%, far greater than in previous years.
- By 1984, industry expects to devote $71.1 billion to R&D, 41% above planned 1981 levels.
- As a percent of sales, U.S. manufacturers plan to hike R&D spending to 2.34% in 1981, up from 2.27% in 1980 and 0.2 percentage points above the recent low of 2.16% in 1979.
- The manufacturing sector's R&D expenditures for energy are expected to reach $4.8 billion this year, 10% of total R&D expenditures, and 10% higher than last year.
- The manufacturing sector's R&D pollution control expenditures are expected to rise 25% this year to $2.6 billion, 5% of total R&D expenditures.

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R&D Expenditures - 1981

All sixteen manufacturing industries anticipate increases in R&D expenditures this year, with plans ranging from 5% in fabricated metals to 31% in electrical machinery (Table I). If all plans are realized, the electrical machinery industry will be the single biggest spender, with 1981 R&D projected to cost $11.6 billion. Aerospace, the second biggest spender, expects R&D spending to hit $9 billion this year. Together, electrical machinery and aerospace would account for 41% of total R&D expenditures.[1] Other industries anticipating large increases in R&D spending are: other manufacturing (27%), nonferrous metals (26%), petroleum (23%), rubber (22%), and chemicals (17%).

While R&D expenditures in the U.S. increased at a relatively rapid rate until the middle 1960s, since then they have remained practically constant in real terms. R&D relative to sales also remained flat for years, suggesting to many analysts that U.S. industry was shying away from risky projects and thereby reducing its ability to innovate. The survey's results point to the possiblity that business may be about to reverse this trend and accelerate R&D spending.

Relative to capital investment, R&D expenditures are expected to trend upward through 1984. Manufacturers peg R&D expenditures at 35.9% of capital spending this year and expect the share to hit 42% in 1984 (Table VII). The aerospace, instruments, and electrical machinery industries all expect to spend more on R&D than on capital goods in the coming years.

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[1]R&D spending by both the electrical machinery and aerospace industries is heavily funded by the government.

R&D Spending Beyond 1981

R&D expenditures are expected to climb 41% from 1981 to 1984, reaching $71.1 billion (Table I). If all plans are met, electrical machinery, machinery, and aerospace expenditures will hit $39.9 billion, 56% of total R&D spending.

Every industry except fabricated metals (-1%) expects to participate in the expenditure growth. In particular, the machinery, other manufacturing, autos, trucks and parts, and electrical machinery industries expect 77%, 59%, 41% and 39% growth respectively.

By 1984, survey cooperators expect R&D expenditures to equal 2.33% of sales (Table VI), about equal to 1981's 2.34%. By contrast, the R&D/capital spending ratio is expected to surge to nearly 18% in 1984 from 14.5% in 1980.

R&D Purposes

Manufacturers expect new product sales to reach $315.0 billion in 1984 and to account for 11% of total sales (Table II). If firms stick to current plans, the pattern of recent years would continue with new product sales falling gradually as a ratio to total sales.

The distribution of R&D expenditures among new products, new processes and improving existing products is expected to remain virtually unchanged in 1981, with 40% going for new products, 17% for new processes and 43% for improving existing products (Table III). But among specific industries the emphasis on these three components of R&D expenditures varies significantly. Three industries expect to concentrate 1981 R&D expenditures on new products: instruments, 73%; paper and pulp, 71%; and

autos, trucks and parts, 59%. At the other extreme, the textile mill products and apparel and the petroleum industries plan to allocate only 4% and 9% of R&D expenditures to new products, respectively.

Textiles and apparel plan the greatest emphasis on new processes, devoting 90% of R&D expenditures to new processes--more than five times the industry average. By contrast, machinery producers expect to spend only 5% of R&D expenditures on new processes.

Expenditures for improving existing products accounts for more than half of total R&D expenditures in three industries; machinery, 70%; petroleum, 60%; and chemicals, 51%.

Pollution Control and Energy R&D

Industries' pollution abatement R&D expenditures will rise 25% to a 1981 total of $2.6 billion (Table IV).

The industry expecting to spend the most R&D funds on pollution control in 1981--$868 million--is electrical machinery, followed by autos, trucks and parts ($534 million), chemicals ($414 million) and petroleum ($266 million). Among manufacturers, only fabricated metals plans to spend less for pollution control R&D in 1981 than in 1980.

The survey also finds that industry expects R&D expenditures on pollution control to fall to $1.5 billion 1982-84. One reason is probably that U.S. industry has been having more success in meeting government pollution standards. Another possible reason is that industry expects the Reagan Administration to scale back the 15-year growth in pollution regulations.

Industrial R&D expenditures for energy--a major factor in R&D in recent years--will reach $4.8 billion in 1981, a gain of 10% over the previous year (Table V). By 1984, business expects energy related R&D to reach $5.5 billion, 28% above the 1980 figure, but only 8% of total planned R&D.

The autos, trucks and parts industry will continue to lead all other industries in energy R&D expenditures, with $1.6 billion planned in 1981, 30% of its own R&D effort and one-third of planned energy related R&D for all industry. The petroleum industry will be second in energy R&D spending in 1981 with $1.5 billion, and it is expected to rank first in 1982-84. The chemicals, instruments, machinery and electrical machinery industries also have relatively large energy-related R&D budgets for 1981.

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NOTE: The other manufacturing category in the tables includes lumber, wood products and furniture, tobacco, printing and publishing, leather, jewelry, toys, and transportation equipment other than autos, trucks and parts and aerospace. The nonmanufacturing category includes mining, construction, electric and gas utilities, commercial enterprises and transportation.

SOURCES: National Science Foundation, McGraw-Hill Publications Company Economics Department

TABLE I

RESEARCH & DEVELOPMENT EXPENDITURES
(Millions of Dollars)

INDUSTRY	1979* Estimated	1980 Estimated	----Planned---- 1981	1984	1980-81 % Change	1981-84 % Change
Iron & Steel	$ 293	$ 317	$ 343	$ 387	8%	13%
Nonferrous Metals	320	380	478	546	26	14
Electrical Machinery	7,584	8,857	11,596	16,167	31	39
Machinery	5,142	5,748	6,425	11,410	12	77
Autos, Trucks & Parts	4,320	5,018	5,543	7,792	10	41
Aerospace	8,414	8,291	9,097	12,366	10	36
Fabricated Metals	445	462	486	482	5	-1
Instruments	2,024	2,352	2,695	3,654	15	36
Stone, Clay & Glass	348	246	279	369	14	32
Chemicals	4,010	4,687	5,465	7,281	17	33
Paper & Pulp	454	764	855	1,076	12	26
Rubber	551	635	776	975	22	26
Petroleum	1,224	1,848	2,269	2,893	23	27
Food & Beverages	475	542	616	755	14	22
Textile Mill Products & Apparel	92	146	162	183	11	13
Other Manufacturing	593	599	763	1,211	27	59
ALL MANUFACTURING	36,289	40,894	47,848	67,547	17	41
ALL NONMANUFACTURING	1,317	2,101	2,666	3,519	27	32
ALL INDUSTRIES	37,606	42,995	50,514	71,066	17	41

* Based on preliminary National Science Foundation data.

TABLE II

NEW PRODUCTS SALES - 1984

INDUSTRY	Percent of 1984 Sales	Billions of Dollars
Iron & Steel	9%	$ 9.38
Nonferrous Metals	5	5.9
Electrical Machinery	17	30.30
Machinery	12	36.13
Autos, Trucks & Parts	15	25.60
Aerospace	12	11.69
Fabricated Metals	4	7.37
Instruments	25	15.55
Stone, Clay & Glass	8	6.88
Other Durables	21	39.21
TOTAL DURABLES	13	187.20
Chemicals	9	25.16
Paper & Pulp	6	7.00
Rubber	11	7.65
Petroleum	3	8.88
Food & Beverages	17	63.32
Textile Mill Products & Apparel	2	3.12
Other Nondurables	6	12.70
TOTAL NONDURABLES	9	127.83
ALL MANUFACTURING	11	315.03

TABLE III

PERCENT OF RESEARCH & DEVELOPMENT EXPENDITURES GOING FOR
NEW PRODUCTS, NEW PROCESSES & IMPROVEMENT OF EXISTING PRODUCTS

	In 1980			In 1981		
INDUSTRY	New Products	New Processes	Improving Existing Products	New Products	New Processes	Improving Existing Products
Iron & Steel	40%	16%	44%	46%	15%	39%
Nonferrous Metals	5	73	22	15	68	17
Electrical Machinery	35	29	36	35	29	36
Machinery	24	5	71	25	5	70
Autos, Trucks & Parts	27	11	62	59	10	31
Aerospace	51	12	37	48	8	44
Fabricated Metals	48	19	33	40	27	33
Instruments	73	8	19	73	8	19
Stone, Clay & Glass	32	30	38	31	31	38
Chemicals	31	19	50	31	18	51
Paper & Pulp	61	8	31	71	8	21
Rubber	28	29	43	28	30	42
Petroleum	13	55	32	9	31	60
Food & Beverages	29	28	43	29	27	44
Textile Mill Products & Apparel	6	89	5	4	90	6
Other Manufacturing	33	26	41	36	20	44
ALL MANUFACTURING	37	19	44	40	17	43

TABLE IV

TOTAL R&D POLLUTION CONTROL EXPENDITURES
(Millions of Dollars)

INDUSTRY	Actual 1980	Planned 1981	% Change 1980-81	Planned 1982-84 (Annual Average)
Iron & Steel	$ 8	$ 9	0%	$ 10
Nonferrous Metals	11	15	36	17
Electrical Machinery	663	868	31	16
Machinery	54	60	11	121
Autos, Trucks & Parts	483	534	11	225
Aerospace	99	108	9	147
Fabricated Metals	13	10	-23	6
Instruments	109	134	23	176
Stone, Clay & Glass	8	16	100	21
Chemicals	365	414	13	371
Paper & Pulp	19	19	0	28
Rubber	36	45	25	57
Petroleum	132	266	102	270
Food & Beverages	20	24	20	30
Textile Mill Products & Apparel	1	2	100	2
Other Manufacturing	31	34	10	30
ALL MANUFACTURING	2,052	2,558	25	1,527

TABLE V

TOTAL ENERGY RELATED R&D EXPENDITURES
(Millions of Dollars)

INDUSTRY	Actual 1980	Planned 1981	% Change 1980-81	Planned 1982-84 (Annual Average)
Iron & Steel	$ 9	$ 14	56%	$ 22
Nonferrous Metals	4	10	150	.7
Electrical Machinery	125	158	26	550
Machinery	168	200	19	394
Autos, Trucks & Parts	1,545	1,604	4	784
Aerospace	233	256	10	348
Fabricated Metals	50	113	126	135
Instruments	194	285	47	373
Stone, Clay & Glass	28	32	14	40
Chemicals	356	449	26	232
Paper & Pulp	16	19	19	27
Rubber	40	49	23	62
Petroleum	1,481	1,456	-2	2,328
Food & Beverages	34	41	21	54
Textile Mill Products & Apparel	12	16	33	22
Other Manufacturing	25	70	180	135
ALL MANUFACTURING	4,320	4,772	10	5,523

TABLE VI

RESEARCH & DEVELOPMENT AS A PERCENT OF SALES

INDUSTRY	1980	1981	1984
Iron & Steel	.49%	.46%	.37%
Nonferrous Metals	.62	.72	.54
Electrical Machinery	7.18	8.50	9.07
Machinery	3.39	3.34	3.79
Autos, Trucks & Parts	4.73	4.61	4.57
Aerospace	16.22	15.70	12.69
Fabricated Metals	.41	.39	.26
Instruments	5.60	5.56	5.88
Stone, Clay & Glass	.50	.49	.43
Chemicals	2.89	2.92	2.60
Paper & Pulp	1.08	1.08	.92
Rubber	1.44	1.45	1.40
Petroleum	1.05	1.11	.98
Food & Beverages	.21	.22	.20
Textile Mill Products & Apparel	.15	.15	.12
Other Manufacturing	.22	.25	.30
ALL MANUFACTURING	2.27	2.34	2.33

TABLE VII

RESEARCH & DEVELOPMENT AS A PERCENT OF CAPITAL SPENDING

INDUSTRY	1980	1981	1984
Iron & Steel	9.64%	9.48%	8.10%
Nonferrous Metals	12.22	12.68	11.49
Electrical Machinery	92.36	105.80	106.36
Machinery	49.59	48.45	67.04
Autos, Trucks & Parts	55.39	49.94	55.11
Aerospace	117.94	153.67	283.62
Fabricated Metals	13.87	14.59	13.35
Instruments	103.16	106.10	117.87
Stone, Clay & Glass	6.44	7.15	8.26
Chemicals	37.21	39.89	49.43
Paper & Pulp	11.24	12.56	16.66
Rubber	36.71	38.80	34.82
Petroleum	8.93	8.24	7.61
Food & Beverages	7.33	6.61	8.10
Textile Mill Products & Apparel	6.13	5.91	7.01
Other Manufacturing	4.89	5.63	8.00
ALL MANUFACTURING	35.31	35.93	42.30
ALL NONMANUFACTURING	1.17	1.35	1.46
ALL INDUSTRIES	14.54	15.26	17.73